Microfinance efficiency in the West African Economic and Monetary Union: have reforms promoted sustainability or outreach?

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MICROFINANCE EFFICIENCY IN THE WEST AFRICAN ECONOMIC AND MONETARY UNION: HAVE REFORMS PROMOTED SUSTAINABILITY OR OUTREACH?

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Abstract:

This study aims to assess the microfinance institutions' (MFIs') efficiency in the West African Economic and Monetary Union (WAEMU) after the reforms that were undertaken in the industry. Given the complementary role between MFIs and banks (where MFIs reach the population that the banks cannot), we ask whether these reforms have promoted sustainability or outreach. For this purpose, we use a data envelopment analysis (DEA) to measure the social efficiency on the one hand and the financial efficiency on the other hand. Our results show that sustainability prevails. Indeed, we observe an increase in financial efficiency at the expense of social and financial efficiency. MFIs that stress outreach tend to be less efficient, when one considers their intermediation role. Moreover, reforms have a negative impact on social efficiency and a positive impact on financial efficiency. Indeed, prudential ratios and accounting standards that were implemented, led MFIs to privilege their intermediation role.

JEL codes : C23, C61, C67, G21, O16, O55.
Key words: efficiency, microfinance, outreach, reform programs, sustainability, WAEMU.

1. INTRODUCTION

Since the creation of the WAEMU, its financial and monetary authorities have tried to organise a financial system so that it could finance local projects for economic development. The creation of development banks was supposed to compensate for the lack of funding for these projects. However, the WAEMU banks did not follow the rules of good management in the allocation of credits. The authorities' mismanagement triggered the banking crisis in the late '80s Daumont et al. (2004). The reforms that followed led the banks to reduce their credit allocation to the private sector. Thus, credit to the private sector decreased from 25 per cent in 1990 to 15 per cent in 2003. This reduction in credit for the private sector shows a lower level of intermediation in the banking system despite the reforms and the modernisation of payment instruments designed to improve the banks' intermediation. Indeed, the credits to the private sector remain very low, at approximately 16.58 per cent on average in 2008. The banking system is still reluctant to reach the market segment composed of economic agents without collateral or to reach small and medium enterprises (SMEs) without transparent accounting. Microfinance institutions (or so-called Decentralised Financial Institutions in the WAEMU), in contrast, manage to reach this market segment through mechanisms that address asymmetric information, such as solidarity groups. MFIs are now observed in the WAEMU as complementary players to banks. MFIs provide financial services to economic actors that are excluded from the traditional financial systems. Microfinance institutions are financial intermediaries, but they also play a social role in financing the promoters of projects who are excluded from the traditional formal financial sector. Small and medium enterprises (SMEs) that do not meet the minimum accounting requirements (suiting a commercial bank) can now find funding for their project investments. Microfinance institutions will also contribute to the financing of financially marginalised economic agents: poor people without collateral or people living in rural areas far from a bank branch.

Given their specific role in the financial system of a developing economy such as the WAEMU, the authorities implemented programs to strengthen this sector and to enable it to be fully part of the financial system. Indeed, in the '90s, the MFIs experienced unprecedented development, as the WAEMU authorities promoted a legal framework for the development of alternative financial structures. Because of their specificities, the WAEMU authorities found it important to promote

the MFIs. However, in their infancy, these financial structures evolved into a legal framework that was ill-defined and poorly regulated. This legal framework could be characterised as very informal. Furthermore, the microfinance industry presented some failures such as lack of financial monitoring, mismanagement, and lack of capabilities. Enforcement programs were especially designed to absorb those weaknesses. Projects for regulatory support (PARMEC) and the monitoring (PASMEC) of Decentralised Financial Systems (MFIs) were implemented. The first program was designed to promote the effective implementation of specific regulations and to strengthen the institutionalisation of the sector. The second program promoted information and experience exchange as well as capacity building. These two projects were followed by PRAFIDE (2005-2009), which aimed at addressing shortcomings and flaws in the sector.

Some recent studies on microfinance address the issue of outreach versus sustainability, as lending to the poor – especially the very poor and/or the rural poor – can be very costly. More specifically, in policy circles there is a significant debate on whether sustainability and outreach are compatible or require a trade-off. Whereas the so-called welfarist view stresses the importance of outreach and the threat of focusing too much on sustainability, the institutionalist view claims that MFIs should focus on sustainability Hermes et al.(2011). Again, it is worth noting that more and more microfinance institutions (MFIs) behave like commercial banks (Grammeen Bank, Banco Solidario, etc.). In the WAEMU, MFIs substitute for banks by lending sometimes very large amounts to the SMEs. The purpose of this study is to assess whether reforms in microfinance industry in WAEMU have promoted sustainability or outreach.

To answer this question, we use the data envelopment analysis (DEA) method instead of stochastic frontier analysis (SFA). Indeed, SFA does not incorporate arguments that are not expressed in monetary units into the function, which is possible for DEA. Thus, we have introduced a poverty index into the DEA efficiency frontier that takes into account the extent to which an MFI lends to poor people. Our results show that financial efficiency increases during the studied period, while social efficiency tends to decrease. This result is strengthened by mean difference test. A second step of analysis leads us to pinpoint that reform programs like PARMEC and PRAFIDE, have a negative impact on social efficiency but a positive one on financial efficiency.

Our study enriches the literature because this is the first study to assess the MFIs' efficiency in the WAEMU after several waves of reforms in the microfinance industry. This study also pinpoints the trade-off between financial efficiency and social efficiency. Moreover, our study shows that reforms strengthen this trade-off. This study is particularly relevant because it comes at a time when the role of microfinance in poverty alleviation is increasingly controversial. Indeed, the evaluation studies (randomised evaluations) yield mixed results regarding the effectiveness of MFIs in alleviating poverty. Therefore, this study on MFIs' efficiency elucidates this issue.

The remainder of the paper is organised as follows. Section 2 presents the stylised facts regarding the WAEMU zone related to the microfinance industry and then a brief literature review on the MFIs' efficiency. In section 3, we set out the research methodology and explain why we use the SFA as well as the DEA method. We also highlight the determinants of efficiency. Section 4 is a discussion where we compare our results to those from other studies on the WAEMU financial system. Section 5 concludes with some policy recommendations.

2 STYLISED FACTS AND LITERATURE REVIEW

2.1 Evolution of the microfinance industry in the WAEMU

Microfinance means devices to provide small loans (microcredit) to poor people to help them lead productive or income-generating activities enabling them to expand their small enterprises. With the development of this particular area of finance around the world, including in developed countries, microfinance has now expanded to include a wider range of services (credit, savings, insurance, money transfer, etc.) and a larger customer base. In this sense, microfinance today is no longer limited to the provision of microcredit to poor people but also to the provision of a package of financial products to those who are excluded from the traditional or the formal financial sector. Microfinance is a solution to banks' reluctance to lend small amounts with low returns and huge transaction costs. Microfinance institutions (MFIs) offer a pragmatic approach to risk management. This approach was implemented for the first time by the Grammeen Bank in Bangladesh by standardising the solidarity group. The solidarity group replaces the physical guarantee by a surety supported by social pressure in the group of borrowers. Thus, this mechanism reduces the transaction costs by self-selection in the group and the management and monitoring of the loan. Similarly, the group plays an important social role because of the principle of solidarity and learning-by-doing that it generates Attali et al. (2007).

In developing countries, the microfinance industry has expanded rapidly in recent years. MFIs are observed as a way to deepen the financial system in those countries Barr (2005). In the WAEMU especially, the oldest MFIs were created in the late '60s. The MFIs then flourished in the late '80s and '90s. Indeed, they were developed to overcome the difficulties encountered by development banks in financing agriculture, small and medium enterprises and handicrafts. These alternative financial structures are aimed at promoting small savings collection in rural and urban areas. For the WAEMU authorities, the microfinance industry is a way to create conditions for a gradual integration of the informal sector into the modern economy. Therefore, the monetary authorities in the WAEMU found it necessary to develop the regulatory framework to provide legal status to these institutions.

Generally, the microfinance regulation intends to frame the industry by defining the scope of the microfinance financial activities and frameworks. Microfinance regulation also aims to provide oversight and monitoring through prudential standards. To this end, MFIs are subject to a particular method of accounting and provisioning for their nonperforming loans. MFIs are also subject to specified financial ratios and prudential management to avert potential crises in the industry and to ensure the protection of depositors.

The conditions for operating as a Financial Decentralised System (FDS), a Microfinance Institution (MFI) or a mutual savings and credit cooperative institution (IMCEC, in French) are defined by a legal and regulatory framework applicable in all member states (loi cadre portant réglementation des IMCEC of 17 December 1993). This law defines the legal statute of the MFIs operating in the WAEMU. There are three types of MFIs in the WAEMU: those with savings and credit as principal activity (approximately 366), those with direct credit as a principal activity (twenty-four) and those with a credit component (sixteen). In addition, two support projects (PARMEC and PASMEC) were established in 1992 in the WAEMU to foster the emergence and development of nearby financing structures.

The PARMEC (the Support Project for the Regulation of Mutual Institutions for Savings and Loans) was mandated in a first phase (1992-1996) to design the specific legal framework for DFS in the Member States of the WAEMU. The PARMEC popularised its content. In the second phase (1997-2002), the PARMEC focused on the effective implementation of specific regulations and the strengthening of institutionalisation in the industry. Furthermore, this second phase was an opportunity to strengthen the equipment of the department in the ministry of finance that was in charge of their MFIs' monitoring and the legal framework. Studies on the viability of the DFS also served to establish an inventory of the sector.

As for the PASMEC (the Support Project for the Monitoring of Mutual Institutions for Savings and Loans), it aimed to promote a better understanding of the alternative finance industry by identifying the stakeholders, their expectations and how they intervene in policies. The PASMEC

lasted from 1992 to 2000. The final aim of this project was to promote information dissemination among microfinance institutions (MFIs).

Both MFI support projects were relayed by the PRAFIDE (Regional Program of Support to Decentralised Financial Systems) over the 2005-2009 period. This program aimed to correct dysfunctions in the microfinance industry. These dysfunctions are as follows: non-compliance with regulations, the failure of information system management and weak internal and external mechanisms for monitoring. The PRAFIDE was therefore designed to encourage the resource protection of depositors and to maintain the integrity and stability of the financial system of the WAEMU. The PRAFIDE also removed impediments to building a financial sector that included the greatest number. There is thus an improvement in the legal environment for MFIs, a strengthening of monitoring (by the Central Bank and the Banking Commission), and an improvement in the financial information provided by MFIs. Lastly, the microfinance industry is becoming more professional, with organised training programs that are adapted to microfinance specificities in the WAEMU.

In addition to these community programs, some member states of the WAEMU are committed with development partners to promote and strengthen the process of microfinance through the adoption of specific national policies. These member states are Benin, Burkina Faso, Mali, Niger, Senegal and Togo.

It is in this context that the microfinance industry grew rapidly, as shown by the strong growth in the supply of local financial services. Indeed, between 1993 and 2006, the number of MFIs was multiplied by six to reach 673. More than 15 per cent of the WAEMU population has access to financial services offered by those institutions, whose loans represent 8 per cent of bank financing in 2006 against less than 1per cent in 1996. Despite the economic difficulties that struck member countries, there has been an increase in the number of branches from 2549 to 2906. With this increased proximity, the number of beneficiaries rose from 3.08 million in 2002 to approximately 4.87 million FCFA in 2006. The amount of deposits has almost doubled during this same period from 166.12 to 317.08 billion FCFA, and the total amount loaned has increased from 190.57 to 385.46 billion. Regarding performance management, the share of equity to total assets decreased

from 19.63 per cent to 14.9 per cent, indicating a decline in the capacity of the MFIs' financing. This decrease was not offset by subsidies, which increased in absolute terms but decreased in terms of their share of assets from 3.25 per cent to 1.93 per cent. Lastly, the nonperforming loans increased from 10.15 to 18.64 billion, but declined as a share of total loans from 5.33 per cent to 4.84 per cent (Table 1).

Table 1: The main DFS indicators from 2002 to 2006 in the WAEMU

Main indicators	2002	2003	2004	2005	2006
Number of DFS that transmitted their financial statements	565	598	643	571	406
Number of branches	2,549	2,827	3,054	3,047	2,906
Number of direct beneficiaries *	3,086,165	3,594,912	3,881,634	4,342,739	4,869,220
Deposits (million FCFA)	166,123	203,370	238,639	276,676	317,080
Average amount of deposits (FCFA)**	68,789	66,983	68,020	70,385	68,722
Equity (million FCFA)	46,001	60,865	70,044	77,276	79,401
Equity (as a share of total assets)	19.63	18.13	17.32	13.60	14.91
Amount of loans distributed in the year (million FCFA)	190,569	255,458	312,429	336,351	385,460
Average amount of distributed loans	254,277	347,395	390,231	381,344	454,329
Number of loans distributed**	924,217	959,545	112,2004	887,811	1,003,984
Nonperforming loans (million FCFA)	10,154	12,064	14,588	17,718	18,639
Nonperforming loans (as a share of total assets)	4.33	3.59	3.61	3.12	3.50
Total Assets (million FCFA)	234,338	335,765	404,391	568,100	532,691
Subsidies (million FCFA)	7,637	7,184	8,458	9,049	10,291
Subsidies (as a share of total assets)	3.26	2.14	2.09	1.59	1.93

**groups are counted on unique basis*
*** DFS for which these amounts are counted are not available*
Source: monographie des SFDs de l'UMOA (Monography of DFSs in WAEMU)

The evolution of the MFIs' total assets relative to the total assets held by banks in the WAEMU reveals an increase from 2002 to 2006, as displayed in *Table 1*. Indeed, this ratio increased from 4.29 per cent to 6.56 per cent. This tendency shows that the sector is gaining ground against the banking sector. Similarly, the ratio of the total assets of the banking system increased from 29.03 per cent to 33.07 per cent as a share of GDP in the WAEMU, while that of MFIs increased from 1.24 per cent to 2.17 per cent. The total assets of MFIs more than doubled during this period from approximately 234.34 billion CFA francs to 532.7 billion CFA francs, table 1. The total assets of

the microfinance institutions is a part of the ever increasing economic activity, although it is still negligible compared to banks.

Table 2: Evolution of DFS and commercial banks' total assets in the WAEMU, from 2002-2006.

Years	2002	2003	2004	2005	2006	Average
Total assets of banks as a share of the WAEMU GDP	29.03	29.84	31.89	28.71	33.07	30.51
Total assets of MFIs as a share of the WAEMU GDP	1.24	1.72	1.96	2.23	2.17	1.87
Ratio of MFIs' total assets to commercial banks' total assets in the WAEMU	4.29	5.78	6.16	7.77	6.56	6.11

Source: author's calculations

However, even if the MFIs' activities have increased relative to the banks', they still have much to learn from the banking sector. The number of MFIs fell sharply, as shown in *Table 3*, from 2004 to 2006. In all countries except for the Ivory Coast, there is a reduction of more than one third of the number of MFIs. This reduction is due to the merger in some large networks, as part of the restructuring program, and the foreclosures of small savings and credit mutual fund cooperative groups as well as other savings and credit institutions.

Table 3: Evolution in the MFIs' number by WAEMU member country

Countries	Years			Changes (%)
	2004 (a)	2005 (b)	2006 (c)	(c-a)/a
Benin	81	84	28	-65.43
Burkina Faso	41	41	38	-7.32
Côte d'Ivoire	19	32	35	84.21
Mali	93	69	64	-31.18
Niger	61	24	30	-50.82
Senegal	290	277	171	-41.03
Togo	58	44	40	-31.03
WAEMU	643	571	406	-36.86

In addition, microfinance products are not very diversified and do not always meet market needs. Financial products are similar; there are not many differences between them in terms of their conditions and forms. One of the major flaws in the microfinance sector is the poor ability to assess client needs and to anticipate market developments. However, since 2007, several institutions have been engaged in developing new products or improving existing products to better satisfy customers but also to meet the pressure of competition between MFIs and banks UNDP (2007)[1].

Now that we have an idea of the evolution of the microfinance institution in the WAEMU, we will review the literature addressing this issue.

2.2 **The theoretical and empirical literature on measuring efficiency**

According to Farrel (1957), we can analyse technical efficiency in terms of the deviation from an ideal frontier isoquant. Defining and measuring efficiency requires the specification of an economic objective and price information on the market. If the purpose of the production unit (or the objective assigned to it by the analyst) is the minimisation of costs, then a measure of cost efficiency is given by the ratio of the minimum cost to the observed cost. The literature on efficiency offers two approaches for the construction of production frontiers and efficiency measurement: the mathematical programming approach and the econometric approach. Both approaches use techniques to wrap data more or less strictly. Thus, they provide different treatments for random noise and flexibility in the technology production structure.

DEA (Data Envelopment Analysis) is an approach that estimates the efficiency frontier using mathematical nonparametric linear programming. DEA provides an analysis based on an assessment of relative efficiency in multiple input /output situations, taking into account each MFI and measuring its performance relative to an outer surface composed of the best practice

[1] Diagnostic approfondi du secteur de la microfinance au Bénin, PNUD, 2007 (Thorough diagnosis of microfiannce industry in Benin, PNUD, 2007)

MFIs. DEA deserves the name data envelopment: it can wrap the data as closely as possible because of assumptions about the structure of the production technology. However, DEA neither addresses noise nor envelops the data as the econometric model does. Many studies that are applied to MFIs have used DEA because it does not impose a functional form to the cost or production function, and it allows a heterogeneous combination of inputs and outputs.

The econometric approach has also been used in studies applied to MFIs. This approach involves an econometric estimation of the frontier of best practices, using its specification according to Cobb-Douglas, CES or translog. Though the econometric approach imposes a functional form, it is much more accurate because it separates the inefficiency from the measurement errors. This approach also offers the possibility of modelling the cost function of a financial entity such an MFI.

The first studies made of MFIs' efficiency were inspired by those studies performed on banks and nonbank financial institutions such as that of Worthington (1998). Therefore, these studies only took into account the financial role of MFIs. However, more and more economists such as Gutiérrez-Nieto et al. (2005, 2009), Hermes et al. (2011), and Serrano-Cinca et al. (2010), became interested in the social role (outreach) of MFIs in addition to their financial efficiency. Thus, two economic schools of thought competed in the literature as to how to measure MFIs' efficiency. The first school highlights the social efficiency and completely disregards the intermediation role of MFIs. This school is called the "Welfarists". The latter school emphasises sustainability; they are the "Institutionalists". However, recently a consensus arose. Under certain market conditions (market strengthening and MFIs' stability), there is compatibility between MFIs' outreach and efficiency/sustainability.

There are very few studies concerned with the efficiency of microfinance institutions because of the difficulty in finding data on balance sheets and income statements. As mentioned previously, the first studies measured the MFIs' efficiency as had been performed for other financial institutions. These studies disregarded the outreach role. Bassem (2008) uses the non-parametric method of data envelopment analysis (DEA) to measure the technical efficiency of 35 MFIs in the Mediterranean region during the 2004-2005 period. Qayyum and Ahmad (2006) evaluate the

efficiency of microfinance in Asia using the DEA. They focus on loan distribution by MFIs to people excluded from the traditional financial sector; they choose their inputs and outputs for this purpose. More specifically, Varman (2008) analyses the efficiency of 26 microfinance institutions in India using Stochastic Frontier Analysis. This study allows the identification of the most efficient microfinance institutions to improve the functioning of other microfinance institutions. Haq et al. **(**2009) make a comparative assessment of 39 MFIs in Asia, Africa and Latin America, using DEA. They found that Non Governmental Organisation MFIs are the most efficient, a result that they explain by pointing out that NGO MFIs fulfil a dual objective to both alleviate poverty and pursue financial sustainability. However, in the outputs used for efficiency assessment, none refers to the outreach function of MFIs. To sum up this first group of studies, they provide insight into MFIs' productivity by only considering the distribution of financial products by MFIs. Indeed, the selected outputs do not capture the outreach function of microfinance institutions, which is to reach the poorest people.

Soulama (2008) tries to take this outreach function into account in his study on the technical efficiency of 94 credit unions in Burkina Faso in 2005, using DEA. To take into account their poverty alleviation role, the author introduces variables of financial sustainability into the efficiency frontier. The idea is that a sustainable institution ensures continuity and viability in poverty alleviation. This tentative attempt to encompass the poverty alleviation role as the MFIs' output is laudable. However, financial ratios cannot effectively take into account the idea that MFIs are able to reach people that are excluded from traditional financial systems.

This exclusion is the issue that Gutiérez-Nieto et al. (2007) address. Actually, these authors will make three studies on the best way to assess MFIs' efficiency. In the first study, the authors propose testing the sensitivity of efficiency scores to the choice of inputs and outputs of 35 Latin American MFIs (NGOs and commercial banks subsidiaries). They show that efficiency can be explained by means of four principal components and that there are some country as well as MFI-type effects. Gutiérrez-Nieto et al. (2009) further their analysis by building DEA indexes on financial, social and both "social-and-financial" efficiencies. They introduce in the outputs the average loan per borrower relative to national income per capita. This variable is supposed to take into account the outreach in terms of poverty reduction. The results show that, generally, the

scores for social-and-financial efficiency are higher. The authors then study the relationship between financial efficiency and social efficiency. They show that when MFIs are facing the dilemma of social efficiency versus financial efficiency, they prefer to choose financial efficiency and sustainability so that they can continue their work in the long run. Finally, in their third study, Serrano-Cinca et al. (2010) further their analysis by considering a poverty index and the percentage of women borrowers as output. The results show a strong correlation between DEA_P (efficiency score with poverty as output) and DEA_W (efficiency score with number of women borrowers as output), which is consistent with the idea that MFIs lending more to women are MFIs that are the most focused on fighting poverty. In addition, a cluster analysis by principal component reveals that the best DEA index for MFIs is the DEA-LRWP (taking into account all financial as well as social outputs). Thus, the best MFIs are those that are capable of ensuring the social task of lending to women and the poor, but in an optimal and sustainable way.

Lastly, some studies, in particular, address this issue of the trade-off between sustainability and outreach. Makame and Murinde (2006) use a balanced panel dataset for thirty-three MFIs in five East African Countries for the 2000-2005 period. Using different measures of the depth (loan size) and breadth (number of borrowers) of outreach, they find strong evidence for a trade-off between outreach and sustainability and efficiency. Again, Hermes et al. (2011) pinpoint the trade-off between MFIs' efficiency and their outreach as an issue in the debate between Institutionalists and Welfarists. These authors test the trade-off between financial sustainability and microfinance outreach by using a stochastic frontier analysis. These authors introduce variables that capture outreach into the efficiency frontier: the average loan per borrower and the percentage of women borrowers. The results show that these two variables for outreach have a negative impact on the MFIs' efficiency. However, this does not necessarily mean that the most efficient MFIs do not contribute to poverty alleviation. In fact, they contribute by the impact of their activities on the macroeconomic level.

Our study aims to elucidate whether sustainability or outreach has been fostered by the microfinance industry reforms in the WAEMU. This area has a very low level of financial development compared to other developing regions. The goal of the monetary authorities was to address this financial system failure, allowing the MFIs to play a complementary role to banks.

Indeed, the MFIs are expected to make financial intermediation where the banks cannot. To the best of our knowledge, no studies have assessed the impact of regulatory reforms in the microfinance industry on the trade-off between outreach and sustainability. Of all of the studies we reviewed above, except that of Hermes et al. (2011), many were made on regions or countries, but with limited data. Our study is the first, to the best of our knowledge, to measure MFIs' efficiency in the WAEMU and to assess the implementation of regulatory reforms.

3. METHODOLOGY

3.1 Efficiency measurement

3.1.1 Model

Our idea is to consider the MFIs' financial intermediation and social roles separately while measuring their efficiency. If the indicators of financial intermediation are expressed in monetary values, the outreach indicators are not. The DEA allows for heterogeneous arguments of the function. Therefore, we will be able to consider in the production function variables that are not expressed in monetary unit. What the econometric method does not allow. Additionally, we will opt for the production approach as opposed to the intermediation approach. The former approach allows us to integrate non-financial products precisely, and that precision is what we would like to insist on. The latter approach presents MFIs as institutions that collect deposits while simultaneously offering credits. We are even more comfortable in our decision to choose the production approach rather than the intermediation approach, because some MFIs in the WAEMU do not collect deposits. Moreover, the data on deposits are not available for most MFIs in our sample, which limits the use of the intermediation approach. The inputs that we choose are the following: financial expenditures (FIEXP), which consist of interest payments on deposits and MFIs' borrowing as well as other financial charges. The second input is capital (CAP), measured by equity. Finally, we consider the number of the MFIs' workers (PERS). We do not consider physical capital due to data limitations. As for outputs, we selected four. The first is an output reflecting the role of financial intermediation: gross loan portfolio (GLP). The other three outputs more reflect the MFIs' outreach. The number of active borrowers (NAB) allows outreach to be taken into account in the sense that an MFI makes loans to individuals who are generally excluded from the traditional banking system. The more that an MFI lends to a significant number of people, the more it fills the social role that banks fail to complete.

The third output is a poverty index. We calculated it using the average loan per borrower (ALB). Hermes et al., 2011, used ALB because it includes the idea that MFIs lend to the poor. Thus, the lower the indicator is, the more poor people the MFI covered. These MFIs participate in financing poor people and in poverty alleviation. However, this indicator does not allow differences in

living standards in a cross-country analysis to be taken into account. To solve this problem, we divided ALB by GNI per capita. In particular, Gutiérrez-Nieto et al., 2009, calculate an index of poverty (POV) based on this ratio.

$$POV = 1 - \frac{\frac{ALB}{GNIc} - \min\left(\frac{ALB}{GNIc}\right)}{Max\left(\frac{ALB}{GNIc}\right) - \min\left(\frac{ALB}{GNIc}\right)}$$

with ALB/GNIc equal to the average loan per borrower for MFI i divided by the per capita Gross National Income. Min(ALB/GNIc) is the minimum of this variable per year and Max(ALB/GNIc) is the maximum. This new variable does not change the statistical properties of the variable ALB/GNIc, but instead allows its standardisation as a poverty index. Thus, the closer the POV is to 1, the more MFI i lends to poor people, and it is the opposite when the index is close to 0.

Finally, the percentage of women borrowers measures the propensity of the MFIs to promote women because they represent the portion of the population most affected by poverty. Statistics are presented in table 4, see appendices.

We measure the efficiency under the following two assumptions: variable and constant returns to scale, (VRS) and (CRS), respectively. The first assumption corresponds better to the environment of imperfect competition in which MFIs operate and prevents bad specifications. The second compares the large to the small MFIs, avoiding the Large MFIs to artificially appear efficient. Lastly, we opt for an input-oriented efficiency measurement that considers that MFIs use as few inputs as the production of outputs requires.

The linear mathematical program used to calculate efficiency scores under the assumption of constant returns to scale is as follows:

$\text{Max}_{u,v}\,(u'y_i/v'x_i)$,
St $u'y_j/v'x_j \leq 1$, $j=1,2,\ldots,N$

$u, v \geq 0$

with x_i as the vector of inputs' matrix K*N of MFI I; y_i as the vector of the output matrix M*N of MFI i; and u' and v' are M*1 and K*1 vectors of the input and output weights, respectively.

To avoid an infinite number of solutions, the constraint $v'x_i = 1$ is imposed, which provides

$\text{Max}_{u,v} (u'y_i)$,

St $u'y_j - v'x_j \leq 0$, j=1,2,…,N

$u, v \geq 0$

Because solving the problem on this form will be difficult, one can use the duality in linear programming and derive an equivalent form of this problem:

$\text{Min}_{\theta\lambda}\ \theta$,

$Sc - y_i + Y\lambda \geq 0$,

$\theta x_i - X\lambda \geq 0$,

$\lambda \geq 0$,

where θ is a scalar and λ is an N*1 vector of constants.

The value of θ obtained will be the efficiency score for the i-th MFI.

To take into account changes in scale economies, the convexity constraint $N1'\lambda = 1$ can be added to provide the following program:

$\text{Min}_{\theta\lambda}\ \theta$,

$St - y_i + Y\lambda \geq 0$,

$\theta x_i - X\lambda \geq 0$,

$N1'\lambda = 1$

$\lambda \geq 0$,

where N1 is an N*1 vector of 1.

The 2 estimated models are as follow:

(GLP) = f (FIEXP, CAP, PERS) for financial efficiency

(NAB, POV, PWOB) = f (FIEXP, CAP, PERS) for social efficiency

3.1.2 Data

We use the MIX market database, which provides financial statements and outreach indicators for MFIs around the world. Our sample is thus composed of 104 MFIs and is quite representative of the 406 MFIs that provide financial statements to BCEAO. Regarding the macroeconomic variables, we will use the Global Development Indicators. Table *(ii)* presents statistics for the variables used for the DEA estimates.

3.1.3 Results

The average value of financial efficiency during the studied period is 39.33 per cent under the CRS assumption (50.65 per cent under the VRS), against 28.67 per cent for social efficiency using CRS (43.29 per cent with VRS). A mean difference test shows that average social efficiency score is different from average financial efficiency score, table 5 in the appendices. Moreover, MFIs' financial efficiency increases while their social efficiency decreases, see graph 1. We therefore try to test, in a second step of analysis, whether reforms program played a role in this evolution.

3.2) Explanatory variables for efficiency

This second step of analysis consists in relating efficiency scores to variables that are likely to explain them. Among those variables, we will consider dummies related to PARMEC and PRAFIDE. Those dummies are equal to 1 after the end of the programs. Indeed, we think that reforms became effective after years of implementation. We also want to avoid endogeneity problems. Other variables are considered. They are classified in three groups.

3.2.1 Variables of financial management and risk

MFIs are financial entities with an outreach objective. Both financial and social-and-financial efficiency are expected to be affected by the financial management and monitoring variables. Thus, we consider three of these variables. The capital asset ratio is measured by total equity over total assets (CAR). Indeed, our previous results show that the decreasing efficiency could be linked to the decrease in capital. We therefore believe that the CAR has a positive impact on the MFIs' efficiency. Similarly, we consider the outstanding balance per portfolio overdue up to 30 days plus the renegotiated portfolio over the gross loan portfolio (RISK). This variable is intended to take into account how risk-taking the MFIs are, and we also expect it to have a negative impact. The higher this ratio is, the more the MFIs mismanage their customer base and fail to make the best use of the surety for moral hazard and adverse selection management. The MFIs' profitability as measured by ROA (return on assets) should have a positive impact on efficiency. As financial institutions, MFIs also look for financial efficiency when doing business. Thus, the most profitable MFIs can be the most efficient. In addition, these MFIs contribute in the long run to the social objective of poverty alleviation through their final macroeconomic impact. We therefore expect a positive sign.

3.2.2 Variables specific to MFIs

The variables related to the MFIs' specificities and their technology for financial product distribution should also impact their efficiency. Among these variables, we note the type of MFI. The data from the MIX market database allows us to classify the MFIs into three categories: those that are related to non-governmental organisations (NGOs), cooperatives (COOP) and finally those that are subsidiaries of banks (NBFIs). We use only two dummies to avoid the problem of singularity. We also consider the variables related to the types of loans: individual lending (INDIV), solidarity lending (SOLID), both individual and solidarity lending (INDIVSOLID) and community lending (COMMUNITY).

The MFIs' size (SIZE) can lead to economies of scale in the distribution of financial products. Size is measured by the logarithm of total assets. We expect a positive sign. The number of years of experience (EXP) can also positively affect the MFIs' efficiency through the learning by doing effect. We consider a fourth variable (FORM), which is supposed to take into account the fact that MFIs provide training or consultation to their clients to promote the better use of their loan. Indeed, this type of product is supposed to increase productive loans by the development of successful "very small businesses". If these training and consultations are not too expensive, the MFIs strengthen their social role. In the event that this training and consultation costs too much, it negatively affects efficiency. The sign is therefore ambiguous for the dummy, FORM. Finally, some MFIs receive subsidies, in particular those related to NGOs. These MFIs are supposed to make more loans to very poor people and therefore be less strict in looking for financial profitability. This flexibility can have a negative as well as a positive impact on efficiency.

3.2.3 Environmental variables

We next consider control variables. The socioeconomic environment within which the MFIs operate can have a positive or a negative impact on their efficiency. We introduce in the regression the level of development as measured by the GDP per capita (GDPc) to capture the positive impact of a healthy economic environment. The size of the rural population should have a positive impact. Indeed, we use it as a proxy for the population requesting microfinance products. The MFIs operate mostly in rural areas and among populations without access to banking services. We believe that the rural population is a good proxy for the importance of the population to which the MFIs' services are addressed. Therefore, the rural population can have a positive impact on efficiency, through economies of scale. We expect a positive sign.

The correlations between the explanatory variables are displayed in *table 6*, in the appendices.

3.2.4 Results

We choose a double-truncated Tobit model to explain both social and financial efficiency scores. The efficiency scores range between 0 and 1. Therefore, the Tobit model seems most appropriate to avoid misspecifications. The results are presented in table 7 and 8.

In terms of the determinants of both social and financial efficiency, the only significant variables are risk, training, subsidies, the institution's type, per capita GDP, the importance of the rural population, the dummy PRAFIDE and the dummy PARMEC. Training (FORM) has a negative impact on financial efficiency because of the involved costs and also because FORM does not necessarily increase the quality of intermediation. Subsidies also have a positive impact on financial efficiency, which indicates that subsidies increase the quality of the MFIs' intermediation. However, against all odds, subsidies have no significant impact on social efficiency. GDP per capita and the importance of the rural population have the expected signs when they are significant. When a microfinance institution is a cooperative, there tends to be a reduction in its social efficiency. This finding can be explained by the functioning of these types of MFIs, which lend prior to their members. Finally, one of the interesting results of the regressions in tables 7 and 8 is that the risk variable has a positive impact on social efficiency and a negative impact on financial efficiency. When one considers their intermediation role, the MFIs' risky behaviour reduces their efficiency. They must, therefore, make an effort in the quality of their portfolio to ensure their sustainability. On the contrary, when one considers the social role of MFIs, they tend to lend more to people without collateral who represent much higher risks. Therefore, these MFIs have a higher risk exposure and greater social efficiency, as they reach the poorest populations with higher risks. Another interesting result is that dummies for PARMEC and PRAFIDE have opposite signs for social and financial efficiency: reforms had a positive impact on financial efficiency, but a negative one on social efficiency. When regulations were strengthened and the microfinance industry was institutionalized, MFIs stressed their financial intermediation role at the expense of their social role. This result is quite intuitive. Indeed, regulations with prudential ratios and accounting standards, led to an industry closer to the banking industry. Therefore, the response of MFIs was to behave more like commercial banks.

Table 7: Tobit regression with explanatory variables for financial efficiency scores under CRS and VRS

	CRS	VRS	CRS	VRS	CRS	VRS
CAR	0.0309	0.0304			0.0313	0.0273
	(0.0278)	(0.0295)			(0.0285)	(0.0318)
ROA			-0.0080	0.0014	-0.0111	0.0011
			(0.0290)	(0.0321)	(0.0299)	(0.0333)
RISK	-0.0414	-0.0375	-0.0486*	-0.0412	-0.0374	-0.0375
	(0.0275)	(0.0292)	(0.0264)	(0.0292)	(0.0271)	(0.0302)
SIZE					0.0295	-0.0060
					(0.0279)	(0.0312)
FORM	-0.0243	-0 .0505 *	-0.0267	-0.0516*	-0.0126	-0.0368
	(0.0278)	(0.0295)	(0.0270)	(0.0298)	(0.0274)	(0.0306)
EXP	-0.0266	-0.0194	-0.0275	-0.0213	-0.0346	-0.0187
	(0.0278)	(0.0295)	(0.0267)	(0.0296)	(0.0283)	(0.0316)
SUB	0.0416	0.0479	0.0427	0.0523*	0.0392	0.0527*
	(0.0282)	(0.0300)	(0.0269)	(0.0298)	(0.0273)	(0.0305)
COOP					-0.0179	-0.0263
					(0.0301)	(0.0336)
NBFI					0.0215	-0.0308
					(0.0581)	(0.0649)
GDPc	-0.0316	0.0447	-0.0203	0.0562	-0.0208	0.0668
	(0.0438)	(0.0466)	(0.0410)	(0.0453)	(0.0443)	(0.0495)
RURALPOP	0.0884*	0.0632	0.0969**	0.0771	0.0797*	0.0715
	(0.0463)	(0.0492)	(0.0429)	(0.0474)	(0.0468)	(0.0522)
PARMEC	0.1151**	0.0786	0.1107**	0.0773	0.1094**	0.0781
	(0.0512)	(0.0545)	(0.0494)	(0.0546)	(0.0487)	(0.0544)
PRAFIDE	0.0135	-0.0337	0.0126	-0.0399	0.0216	-0.0238
	(0.0589)	(0.0628)	(0.0566)	(0.0626)	(0.0563)	(0.0628)
CONSTANT	0.2846***	0.4171***	0.3010***	0.4226***	0.2791***	0.4121***
	(0.0645)	(0.0686)	(0.0661)	(0.0731)	(0.0680)	(0.0759)
loglikelihood ratio	34.25	14.81	33.69	13.75	32.5	14.71
number of observations	394	394	394	394	382	382

*,**,*** significant at the 10, 5 and 1% levels, respectively.

Table 8: Tobit regression with explanatory variables for social efficiency scores under CRS and VRS

	CRS	VRS	CRS	VRS	CRS	VRS
CAR	0.0331	0.0176			0.0129	0.0084
	(0.0296)	(0.0343)			(0.0306)	(0.0374)
ROA			0.0167	0.0263	0.0140	0.0204
			(0.0304)	(0.0372)	(0.0321)	(0.0392)
RISK	0.1044***	0.0913**	0.0959***	0.0923**	0.1014***	0.0953**
	(0.0292)	(0.0339)	(0.0277)	(0.0339)	(0.0291)	(0.0355)
SIZE					0.0209	0.0115
					(0.0300)	(0.0366)
FORM	-0.0322	-0.0164	-0.0301	-0.0136	-0.0253	-0.0137
	(0.0295)	(0.0343)	(0.0283)	(0.0346)	(0.0295)	(0.0360)
EXP	0.0110	-0.0227	0.0095	0.0252	-0.0001	-0.0242
	(0.0295)	(0.0343)	(0.0280)	(0.0343)	(0.0305)	(0.0372)
SUB	0.0028	0.0268	0.0094	0.0295	0.0040	0.0255
	(0.0300)	(0.0349)	(0.0282)	(0.0345)	(0.0293)	(0.0358)
COOP					-0.0591*	-0.0401
					(0.0324)	(0.0395)
NBFI					-0.0408	0.0172
					(0.0624)	(0.0762)
GDPc	0.0757*	0.0683	0.0857**	0.0733	0.0681	0.0585
	(0.0466)	(0.0542)	(0.0430)	(0.0526)	(0.0476)	(0.0581)
RURALPOP	0.0390	0.0582	0.0536	0.0643	0.0417	0.0501
	(0.0492)	(0.0572)	(0.0450)	(0.0550)	(0.0503)	(0.0614)
PARMEC	-0.0779	-0.1248**	-0.0769	-0.1237**	-0.0674	-0.1192*
	(0.0546)	(0.0634)	(0.0518)	(0.0634)	(0.0523)	(0.0639)
PRAFIDE	-0.1311**	-0.1187*	-0.1327**	-0.1224*	-0.1278**	-0.1247*
	(0.0626)	(0.0729)	(0.0593)	(0.0726)	(0.0604)	(0.07382)
CONSTANT	0.2803***	0.4578***	0.2687***	0.4404***	0.3041***	0.4705***
	(0.0686)	(0.0798)	(0.0694)	(0.0849)	(0.0731)	(0.0892)
loglikelihood ratio	26.41	16.96	25.68	17.19	28.21	17.29
number of observations	394	394	394	394	382	382

*,**,*** significant at the 10, 5 and 1% levels, respectively.

4 DISCUSSION

Microfinance institutions are observed in the WAEMU's financial system as complementary players to banks. The WAEMU banks, though liquid, are reluctant to grant loans to small and medium enterprises. The reforms of the banking system from 1993 to 1996 were designed to make it more efficient in this area. Azam et al. (2004) discuss in this context the pro and cons of bank privatisation as a solution for a more efficient banking system. They also show that regulation by independent agencies can be more effective in ensuring the efficiency of the banking system. Another major reform was the liberalisation of the banking conditions for financial product distribution. This liberalisation intended to allow banks to better compete with each other and to promote the optimal allocation of financial resources to the economy. These reforms appeared to be successful as evidenced by the results of Kablan (2009). However, the author is cautious in her conclusions about the WAEMU banks' efficiency because they collect deposits for allocation to short-term loans that do not finance investment for growth. Another problem of the WAEMU banks is that certain segments of the population cannot access their loans. These segments are able to find financing from microfinance institutions that can manage the asymmetric information problems that characterise these types of clients. This ability is why MFIs have gained a position not only as institutions lending to the poor but also as financial intermediaries, replacing banks in lending to small and medium enterprises.

The results of the present study show that the MFIs' efficiency increased when they remained in their role as financial intermediaries. Indeed, several programs were implemented to regulate the sector, which until then was operating in an informal environment. These reforms have institutionalised the industry to enable it to effectively take its place in the financial system. These reforms have borne fruit because financial efficiency has increased. However, this increase occurred at the expense of social efficiency, which decreases over the studied period. Explanations can be found in a restructuration of the sector that has led to many foreclosures. Again, the outreach variables in several countries of the WAEMU have tended to deteriorate. This deterioration leads us to the conclusion that the regulation and reforms (with ratios of surveillance and regulatory conditions to respect) lead MFIs to behave more like commercial banks. The dummy variables related to PARMEC and PRAFIDE prove to have a positive impact

on financial efficiency and a negative impact on social efficiency. Thus, although the issue of microfinance industry regulation is solved, it comes at the expense of a lower level of outreach. This result raises the issue of implementing mechanisms to encourage the MFIs to reach the segment of the population that banks fail to reach.

In the economic literature, several studies have investigated the idea of linking informal and formal finance. The literature on financial linkage is based on modern economic theory, which explains that, due to information asymmetry in financial markets and the lack of regulation of the credit markets, there is a relevant mismatch of resources and abilities between formal and informal lenders (Amendariz de Aghion and Morduch, 2005; Varghese, 2005). Formal financial institutions have extensive infrastructure and systems, funds and opportunities for portfolio diversification to their advantage, which allows them to present a wide range of services to their clients. In contrast, the informal financial institutions operate close to rural populations and have information on their clients that enables them to conduct their operation productively. The idea is to allow the formal and informal financial institutions to borrow (their advantages) from each other. The most common way to accomplish financial linkage is to encourage commercial banks to have microfinance subsidiaries. This idea of financial linkage is a good one to explore for the WAEMU countries. The banks have expertise in adapting their products to the needs of their customers, which is not always the case for the MFIs in the WAEMU, as noted in section 2. Moreover, it could be an opportunity to deal with risks and management issue of MFIs branches. Many initiatives exist in developing countries where the commercial banks have opened microfinance branches. These branches are already being opened in some of the WAEMU countries such as Mali with BNDA and Senegal with the CNCA. A policy to encourage these openings would be to lighten the tax burden on banks that allocate credit through semi-formal and informal agents while increasing taxes on those who do not have microfinance branches. But, as we have observed in our study, financial linkage can be created at the expense of the MFIs' outreach. Our study also shows that the trade-off between outreach and sustainability is explained by the costs incurred through risk and profitability. So, the idea would be to find ways to overcome these two problems. Aryeetey and Fenny (2010) present technological innovations as one of the ways to reduce transaction costs. Technological innovations can allow the unbanked segments of the market to be reached at a low expense.

5 CONCLUSION

Our study is part of the debate on the trade-off between sustainability and the outreach of MFIs i.e., the institutionalist versus the welfarist viewpoints. This study is particularly relevant given the specific role that MFIs play as the complementary actors of banks in the WAEMU financial system. This study also provides an opportunity to question the effectiveness of the reform programs that were implemented and to examine which of the two views was encouraged, given this specific role of MFIs in the WAEMU.

Using a data envelopment analysis we were able to assess the MFIs' social-and-financial efficiency. We consider two frontier functions: financial efficiency with outputs that are related to financial intermediation and social efficiency with outputs that are related to outreach. Part of the originality of our study is the consideration of the assessment of the DEA efficiency index, a poverty index that we calculated using the MFIs' data portfolios.

The results show that financial efficiency is growing at the expense of social efficiency. Moreover, RISK has a positive impact on social efficiency and a negative impact on financial efficiency. When a MFI stresses outreach, it has to take more risk. This behaviour can jeopardize its financial efficiency and sustainability. Reform programs like PARMEC and PRAFIDE had a negative impact on social efficiency, but a positive one on financial efficiency. This is another originality of our study. No other studies, to the best of our knowledge analyze the impact of reforms on the microfinance industry. When MFIs regulatory environment is transformed in order to meet supervisory conditions and accounting standards, they tend to behave more like commercial banks. Therefore, the issue of regulation is solved, but at the expense of the original role of MFIs. In the discussion above, we pinpoint the importance of MFIs in developing countries like WAEMU. An important segment of the population is deprived from financial services. MFIs were seen like a solution. However, if the regulatory framework and other changes in their environment prevent them from this outcome, the financial authorities in developing countries have to find proper solution. The literature on financial linkage coupled with the use of

technological innovations could reduce transaction costs and risks. Thus, it could be less costly to reach the unbanked segment of the population.

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Appendix

Tables

Table 4. Statistics for the inputs and outputs used for the estimate of the efficiency scores with DEA

Variable	Mean	Standard Deviation	Minimum	Maximum
FIEXP*	1.22E+08	2.53E+08	0	2.03E+09
OPEXP*	8.51E+08	1.88E+09	659377.8	1.77E+10
PERS	123.04	200.205	2	1005
POV	0.8548	0.211	0	1
NAB	15384.68	22822.78	16	112166
GLP*	5.06E+09	1.06E+10	68416.65	7.88E+10
PWOB	0.5895	0.2725	0.0075	11.937

**Monetary values are expressed in CFA Francs.*

Table 5. Mean difference test for financial efficiency scores and social efficiency scores

a- CRS estimate:

Variable	Observations	Mean	standard deviation	standard error	95% condidence interval	
Financial efficiency	396	.4016	.0131	.2611	.3758	.4274
Social efficiency	396	.2992	.0136	.2710	.2724	.3259
Difference	396	.1023	.0186	.3704	.0657	.1389

b-VRS estimate

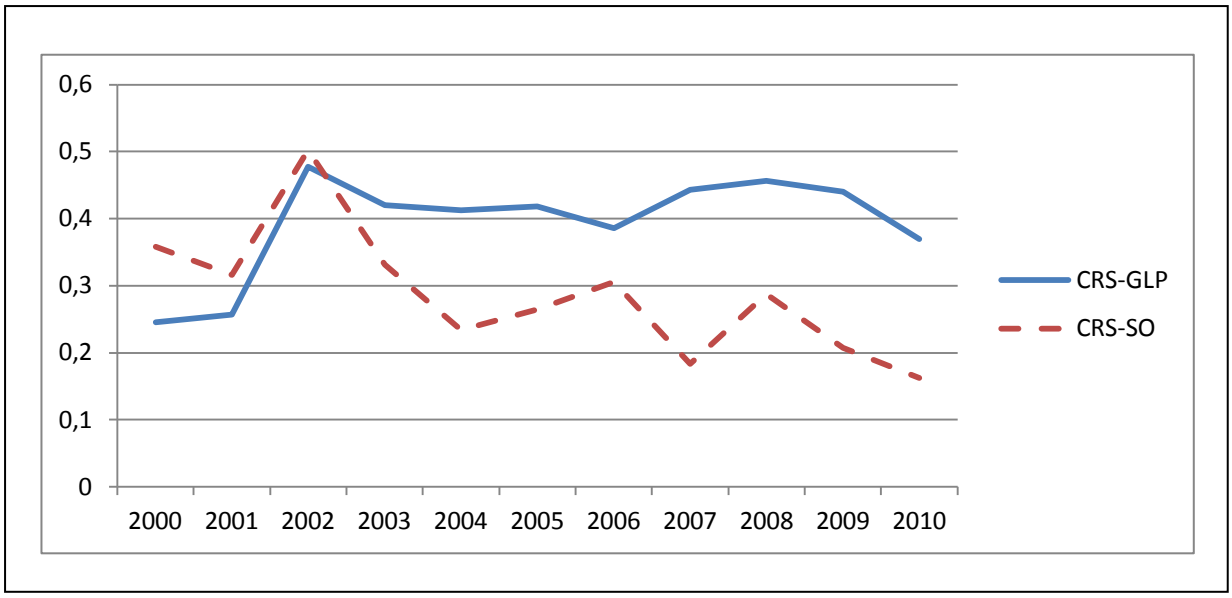
Variable	Observations	Mean	Standard error	Standard Deviation	95% Confidence Interval	
Financial efficiency	396	.5304	.0141	.2815	.5026	.5582
Social efficiency	396	.4306	.0164	.3282	.3982	.4630
Difference	396	.0997	.0186	.3707	.0631	.13638

Table 6.Correlation coefficients for the explanatory variables

	CAR	DER	RISK	ROA	SIZE	FORM	EXP	SUBV
CAR	1							
	510							
DER	-0.3340*	1						
	0							
	510	510						
RISK	-0.1328*	0.0352	1					
	0.0027	0.4283						
	510	510	510					
ROA	0.0702	0.0548	-0.0963*	1				
	0.1135	0.2163	0.0296					
	510	510	510	510				
SIZE	-0.0517	0.039	-0.1515*	0.2166*	1			
	0.2437	0.3792	0.0006	0				
	510	510	510	510	510			
FORM	-0.0989*	0.0633	0.044	-0.1230*	-0.0944*	1		
	0.0256	0.1536	0.3208	0.0054	0.033			
	510	510	510	510	510	510		
EXP	-0.0203	-0.0285	-0.0898*	0.0921*	0.3767*	-0.0583	1	
	0.6482	0.5215	0.0428	0.0375	0	0.1888		
	510	510	510	510	510	510	510	
SUBV	0.0860*	-0.0314	-0.1209*	-0.018	0.1135*	0.0825*	0.2530*	1
	0.0523	0.4792	0.0062	0.6849	0.0103	0.0627	0	
	510	510	510	510	510	510	510	510

**signif icant at the 10% level*.

Figure 1. The trade-off between social efficiency and financial efficiency of MFIs in the WAEMU



CRS-GLP: financial efficiency, CRS-SO: social efficiency.